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(54) Improvement of Devices for Measurement or Electric Transmission in relation to pressure

(72) Invention of:

(33) (32) (31) Conventional priority:

The present invention relates to manometers and thermometers and, more generally, instruments for measuring pressure and any other value relating to pressure, in which the deformation of a Bourdon tube or similar device determines the variation of electric voltage through the variation of an air-gap.

In accordance with the invention, the moving vane linked to the Bourdon tube, as well as the associated windings, are positioned outside the space surrounded by the Bourdon tube, which allows them to be placed in a connected casing that is distinct from the casing containing this tube.

One notices various advantages that can be achieved in this manner. First of all, it is easy to disperse the heat resulting from the flow of current in the windings, in such a way that the generation of heat no longer influences the precision or the reliability of the manometer.

Furthermore, the trajectory radius described by the vane is increased, resulting in an increase in sensitivity and a decrease of the trajectory curve described by the vane, making the operation more linear.

Finally, since the central part of the Bourdon tube is unobstructed, it is easy to assemble the conventional mechanism, giving a direct indication of the pressure in addition to the electrical measurement.

The following description regarding the attached figure, given as a non-restrictive example, explains how the invention can be achieved. The specifics in the figures, as well as in the text, are, of course, part of said invention.

Figure 1 shows a manometer of the conventional type, improved according to the invention.

Figures 2 and 3 are detailed cross-sectional views according to the lines II-II and III-III.

The figure shows a manometer composed of a Bourdon tube 1 in cross section in the form of a flattened ellipse positioned roughly according to a circular arch within a cylindrical casing 2. At one of

the ends, tube 1 is attached, by soldering, for example, on a tip 3 pierced by a channel 4 that communicates with the inside of tube 1,

through which the fluid whose pressure is to be measured emerges. The other end 5 of the tube 1 is hermetically sealed, in such a way that the pressure causes a deformation of tube 1 that corresponds to said pressure. The cylindrical casing 2 is also sealed, whereby one of its flat sides can be made of a transparent disc, as is usually the case. The sealed end 5 of tube 1 has a vane 6 made of magnetic material which is positioned facing, and at a small distance from, the flat poles 7, 8, 9, with the magnetic cores ending in a common yoke of three coils 10, 11, 12. The length of vane 6 only covers part of the two outside poles 7 and 9. The coils 10, 11, 12 and the pole 7, 8, 9 are fixed, whereas the vane 6 is linked to the end of the Bourdon tube and moves with it, such movement of the vane occurring within its plane.

It follows that for a certain configuration of tube 1 that corresponds to a determined pressure P_0, the surfaces covered by vane 6 on the two outside poles 7 and 9, which is to say, the air-gap surfaces of these poles, are identical, whereas if, for example, a deformation of tube 1 causes an upward displacement of the vane of figure 1, the air-gap surface on the upper pole 9 increases, resulting in a corresponding decrease of the air-gap surface on the lower pole. Inversely, in the event of a decrease in pressure, vane 6 will move towards the bottom of the figure, increasing the air-gap on the lower pole 7 and decreasing it on the upper pole 9.

Together, the three coils constitute a differential transformer, of which the center coil 11, supplied by an appropriate alternating voltage, forms the inductor, and the extreme coils 10 and 12 represent the armatures.

The movement of vane 6 in this way modifies the mutual induction coefficient of the armature coils 10 and 12, and the pressure variations can be detected by putting the two induced voltages in opposition, the resulting voltage being used to provide either a direct reading or to feed into receiver instruments.

As can be seen in the figure, the three coils, as well as the vane 6, are placed outside the space surrounded by the

Bourdon tube 1, whereby the yoke of the magnetic circuit of the coils can be fixed, for instance, on a plate 13, extending the base 14 of casing 2 laterally. Plate 13 can, in turn, form the base of a small rectangular casing 15 adjacent to casing 2.

This casing 15 can be pierced with holes such as 16 in order to allow the free circulation of air. It can also be equipped with cooling ribs 17, in a way such that the heat released by the flow of current is effectively dispersed.

The small, T-shaped vane 6, can be attached by means of a system of screws and nuts on a plane 5a, adjacent to the closed end of the Bourdon tube, or by a screw 18 having a smooth central part 18a, which allows the easy adjustment of the vane's position.

As it is understood, the trajectory described by the vane has a curve that is smaller than the end 5 of the Bourdon tube, the linearity of the operation therefore being improved.

It is furthermore possible to include a conventional mechanism inside the central part of the tube in order to activate a needle 20 that changes position along a dial. For example, a segment gear 21 activates a pinion 22 that is interdependent with the needle, and placed in rotation around a pivot 23 by means of a small connecting rod 24.

It goes without saying that the described functional design is only an example, and that it may be modified, notably through the substitution of technically equivalent processes without going beyond the scope of the invention.

In particular, instead of being placed laterally on a casing containing the Bourdon tube, as in the functional design represented in the figure, the windings and the vane may be positioned on a different plane than the Bourdon tube, for example above or below the casing containing the tube. The linking device between the tube and the vane would then exit the casing through an elongated opening, allowing the device to move during the deformations of the Bourdon tube.

The invention is clearly applicable to thermometers or other instruments in which the pressure affecting the Bourdon tube is

generated by a value to be measured, for example, a temperature.

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FIG. 1

FIG. 2

FIG. 3